Attorney Docket No. 1015290-000682

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re Patent Application of | **Mail Stop APPEAL BRIEF - PATENTS** |
| Robert J. Steger | Group Art Unit: 1763 |
| Application No.: 10/608,091 | Examiner: RAKESH KUMAR DHINGRA |
| Filed: June 30, 2003 | Confirmation No.: 8130 |
| For: SUBSTRATE SUPPORT HAVING DYNAMIC TEMPERATURE CONTROL | Appeal No.: |

## APPEAL BRIEF

**Mail Stop APPEAL BRIEF - PATENTS**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Sir:

This appeal is from the Official Action mailed November 24, 2006, twice rejecting Claims 1-12 and 15-23, which are reproduced as the Claims Appendix of this brief.

Charge the $500.00 (1402) Government fee to credit card. Form PTO-2038 is attached.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

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## I. Real Party in Interest

The present application is assigned to Lam Research Corporation.

## II. Related Appeals and Interferences

The Appellant's legal representative, or assignee, does not know of any other appeal or interferences which will affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

## III. Status of Claims

Claims 13, 14, and 24-31 have been withdrawn, while Claims 1-12 and 15-23 stand rejected and are being appealed. See attached Claims Appendix for a copy of the claims involved in the appeal.

## IV. Status of Amendments

No claim amendments were filed subsequent to the rejection mailed November 24, 2006.

## V. Summary of Claimed Subject Matter

The claimed substrate support provides for a heat transfer member with a low thermal mass and dynamic temperature control capabilities for rapid heating and/or cooling to a desired temperature (page 5, lines 7-10; paragraph **[0019]**). Such a substrate support provides additional capabilities during the plasma processing of semiconductor substrates, for example, accurate, step-changeable temperature control in gate and shallow trench isolation etching processes (page 14, lines 10-15;

paragraph **[0049]**). Further examples of increased capabilities include the ability to linearly ramp temperature to form tapered sidewalls or more effectively prevent thermal damage to the substrate during dielectric etch (page 14, lines 13-19; paragraph **[0049]**). The low thermal mass of the claimed substrate support also provides the advantage of consuming a smaller volumetric flow rate of liquid to achieve the desired temperature, as compared to a larger cold plate having a large thermal mass (page 12, lines 12-16; paragraph **[0043]**).

Claims 1-11 are directed towards a substrate support useful in a reaction chamber of a plasma processing apparatus. Claim 12 is directed at a plasma processing apparatus comprising the substrate support of Claim 1. Claims 15-22 are directed towards a substrate support useful in a plasma processing apparatus. Claim 23 is directed at a plasma processing apparatus comprising the substrate support of Claim 15. Claims 1 and 15 are independent claims.

Claim 1 is directed at a substrate support useful in a reaction chamber of a plasma processing apparatus. The substrate support comprises a ceramic member, a metallic heat transfer member overlying the ceramic member, the heat transfer member having a maximum thickness of about ¼ inch, the heat transfer member including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member; and an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus. An example of the claimed substrate support is described in the specification, from page 12, line 17 to line 27 (paragraph **[0044]**) and FIGs. 2-6. An example of the claimed electrostatic chuck is described in the specification, from page 10, line 22 to line 24 (paragraph

**[0039]**). An example of the claimed reaction chamber is described in the specification, from page 5, line 26 to page 6, line 14 (paragraphs **[0022]**-**[0023]**).

Claim 15 is directed at a substrate support useful in a plasma processing apparatus. The substrate support comprises a source of temperature controlled liquid; a ceramic member; a metallic heat transfer member overlying the ceramic member, the heat transfer member including at least one flow passage in fluid communication with the liquid source and through which the liquid can be circulated to heat and/or cool the heat transfer member at a rate of from about 0.25-2 °C/sec; and an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus. An example of the claimed substrate support is described in the specification, from page 12, line 17 to line 27 (paragraph **[0044]**) and FIGs. 2-6. An example of the claimed electrostatic chuck is described in the specification, from page 10, line 22 to line 24 (paragraph **[0039]**). An example of the claimed reaction chamber is described in the specification, from page 5, line 26 to page 6, line 14 (paragraphs **[0022]**-**[0023]**).

## VI. Grounds of Rejection to be Reviewed on Appeal

### A. Claims 1, 2, 4, 6, 7 and 12

Claims 1, 2, 4, 6, 7 and 12 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura et al. (U.S. Patent No. 6,676,805) ("Tamura I"), as evidenced by Tamura et al. (U.S. Patent Application Publication No. 2001/0009178) ("Tamura II"), in view of Matsumura et al. (U.S. Patent No. 5,225,663) ("Matsumura").

**B. Claim 3**

Claim 3 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Matsumura, further in view of Kadotani et al. (U.S. Patent Application Publication No. 2004/0163601) ("Kadotani") and Cardella (U.S. Patent No. 6,184,504) ("Cardella").

**C. Claim 5**

Claim 5 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Matsumura, further in view of Oda et al. (U.S. Patent No. 6,474,986) ("Oda").

**D. Claim 8**

Claim 8 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Matsumura, further in view of Yatsuda et al. (U.S. Patent No. 6,488,863) ("Yatsuda") and Mahawili et al. (U.S. Patent No. 6,007,635) ("Mahawili").

**E. Claims 9 and 10**

Claims 9 and 10 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Matsumura, further in view of Mimura et al. (U.S. Patent No. 7,022,616) ("Mimura").

**F. Claim 11**

Claim 11 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Matsumura, further in view of Wang et al. (U.S. Patent Application Publication No. 2002/0075624) ("Wang").

**G. Claims 15, 18 and 23**

Claims 15, 18 and 23 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella.

**H. Claim 16**

Claim 16 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella, further in view of Matsumura.

**I. Claim 17**

Claim 17 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella, further in view of Yang et al. (U.S. Patent No. 6,635,580) ("Yang").

**J. Claim 19**

Claim 19 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella, further in view of Yatsuda and Mahawili.

**K. Claims 20 and 21**

Claims 20 and 21 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella, further in view of Mimura.

**L. Claim 22**

Claim 22 stands rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Tamura I, as evidenced by Tamura II, in view of Kadotani and Cardella, further in view of Wang.

## VII. Argument

### A. Legal Standards

### 1. Obviousness

Under 35 U.S.C. §103(a), the Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. M.P.E.P. § 2142. As set forth in M.P.E.P. § 2143, one requirement for establishing a *prima facie* case of obviousness is that the combination of references must teach or suggest all the claim features. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). For a proper obviousness rejection, the Patent Office must provide "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" and not "mere conclusory statements." *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14 (U.S. Apr. 30, 2007) (quoting *In re Kahn*, 441 F.3d 977, 988, (Fed. Cir. 2006)). An obviousness rejection must rest upon a factual basis rather than conjecture, speculation or assumptions. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968).

### 2. Optimization of Ranges

In general, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); M.P.E.P. § 2144.05(II)(A). However, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of the variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977); M.P.E.P. § 2144.05(II)(B).

### B. Claims 1, 2, 4, 6, 7 and 12

The Official Action contends that Claims 1, 2, 4, 6, 7 and 12 are allegedly unpatentable over Tamura I, Tamura II and Matsumura (Official Action at page 6, lines 17-18). Appellant respectfully requests reversal of the rejection because: (1) Tamura I and Matsumura have been improperly combined; (2) neither Tamura I nor Matsumura recognizes thickness of a liquid cooled heat transfer member as a result-effective variable for quickly raising and lowering the temperature; (3) and the cited references do not disclose or suggest all claim features.

Claim 1 recites a substrate support useful in a reaction chamber of a plasma processing apparatus, the substrate support comprising a ceramic member; a metallic heat transfer member overlying the ceramic member, the heat transfer member having a maximum thickness of about ¼ inch, the heat transfer member including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member; and an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus (emphasis added).

#### 1. Improper Combination of References Because Tamura and Matsumura Seek Opposite Objectives

The Official Action acknowledges the Tamura I and Tamura II do not disclose a thickness of a heat transfer member (Official Action at page 5, lines 7-8), but contends that it would have been obvious to "optimize the maximum thickness of [the] heat transfer member" as "an additional control variable for quickly raising and lowering the temperature of [the] heat transfer plate" (emphasis added) (Official Action at page 5, lines 17-21). Appellant respectfully disagrees, because Tamura I

and Matsumura seek opposite objectives using different elements to achieve different functions, as explained below.

**a. Substrate Support of Tamura I Cools Substrates in a Vacuum**

Tamura I is directed to cooling a semiconductor substrate which becomes heated by plasma during processing in a vacuum environment such as during etching (column 5, lines 2-67; column 13, lines 29-33). Cooling to remove heat from the plasma **16** is accomplished by supplying coolant **4** to holding member **2** and supplying cooling gas **7** to a gap between a substrate **1** and the holding member **2** (column 9, lines 31-50).

**b. Substrate Support of Matsumura Heats Substrates for Photoresist Baking**

Matsumura does not relate to plasma processing, but rather to the baking of substrates after a photoresist has been applied (column 1, lines 8-15). The heat process device of Matsumura does not include any cooling mechanism. Instead, Matsumura uses a thin conductive film **2** to heat plate **1** which heats semiconductor wafer **8** (column 3, line 62 to column 4, line 5). Matsumura uses resistive heating to rapidly raise the temperature of the wafer to a temperature of 200°C (column 5, lines 35-54). The heating plate 1 of Matsumura utilizes different elements (resistive heating) to achieve a different result (heating) than the backside cooling device of Matsumura.

**c. Lack of Articulated Reasoning for Combination**

The Official Action has not provided "some articulated reasoning with some rational underpinning" as to why one of ordinary skill in the art would combine Tamura I, which is directed at cooling a substrate undergoing plasma treatment with gas in a vacuum environment with Matsumura, which is directed at heating a

substrate by resistive heating. *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14 (U.S. Apr. 30, 2007) (quoting *In re Kahn*, 441 F.3d 977, 988, (Fed. Cir. 2006)). Moreover, Appellant respectfully submits that the Examiner's position that it would have been obvious to "optimize the maximum thickness of [the] heat transfer member" as "an additional control variable for quickly raising and lowering the temperature of [the] heat transfer plate" (Official Action at page 5, lines 17-21) is improper because an obviousness rejection cannot be supported by "mere conclusory statements." *Id.*

**2. Neither Tamura I Nor Matsumura Recognizes Thickness of a Liquid Cooled Heat Transfer Member as a Result-Effective Variable for Quickly Raising and Lowering Temperature**

The Official Action acknowledges the Tamura I and Tamura II do not disclose a thickness of a heat transfer member (Official Action at page 5, lines 7-8), but contends that it would have been obvious to "optimize the maximum thickness of [the] heat transfer member" as "an additional control variable for quickly raising and lowering the temperature of [the] heat transfer plate" (emphasis added) (Official Action at page 5, lines 17-21). Appellant respectfully disagrees, because Matsumura's heating plate is configured to account for differences in resistance heating of a thin film compared to prior resistance heating wires. Matsumura fails to address heating and cooling using circulating liquid and thus does not recognize thickness of a heat transfer member having a flow passage therein as a result-effective variable for "quickly raising and lowering the temperature." M.P.E.P. § 2144.05(II)(B).

Tamura seeks to cool a substrate undergoing plasma processing whereas Matsumura seeks to bake a resist coated wafer. Matsumura's heating device is

designed "to apply uniform heat ... to an object to be processed" (emphasis added) (column 2, lines 19-20) in the context of curing a photoresist film on a semiconductor substrate (column 1, lines 23-26). Matsumura's heat transfer plate **1** is thinner than a heat plate with resistance wire because the application of current to a thin conductive film **2** produces a more uniform temperature (column 4, lines 41-55; FIG. 7), than heating elements that use an electric resistance wire (column 1, lines 29-37). Thus, Matsumura is not related to Tamura's cooling member 2 and provides no recognition of optimizing the thickness of a liquid cooled heat transfer member. Matsumura's resistive heating plate fails to support the Examiner's "optimization" position.

### 3. The Cited References Do Not Disclose or Suggest All Claim Features

Appellant respectfully urges reversal of the rejection to Claims 1, 2, 4, 6, 7, and 12, because the combination of Tamura I, Tamura II and Matsumura does not disclose or suggest all claim features, as explained below.

#### a. Claim 1 - No Disclosure or Suggestion of a Heat Transfer Member Having a Maximum Thickness of ¼ Inch and Including at Least One Flow Passage

The Official Action acknowledges that the cited references fail to disclose the claim feature of a heat transfer member having a maximum thickness of about ¼ inch (Official Action at page 5, lines 7-8). The Official Action contends that the claimed thickness is obvious, but cites no prior art in support of this position. Clearly, there is no teaching in the cited references of the claimed liquid cooled heat transfer member and thus no basis for the rejection.

Matsumura discloses a heating element used for baking photoresist films on semiconductor wafers (column 1, line 9 to column 2, line 26). Heat is conducted to semiconductor wafer **8** by contact with heating plate **1** (column 4, lines 1-5). However, Matsumura fails to disclose a "heat transfer member having a maximum thickness of ¼ inch and including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member," as recited in Claim 1. Thus, the combination of Tamura and Matsumura fails to produce the combination of features recited in Claim 1.

Tamura I discloses a substrate holding system including coolant flow passages **42** in holding member **2** (column 15, lines 40-47; FIG. 9). Tamura II is cited to demonstrate that liquid coolant is "an art recognized coolant material" (Official Action at page 5, lines 3-6). However, neither Tamura I nor Tamura II provide any disclosure of a "heat transfer member having a maximum thickness of ¼ inch and including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member," as recited in Claim 1. As the claimed feature is missing in the prior art, the rejection should be reversed.

**b. Claim 1 - No Disclosure or Suggestion of an Electrostatic Chuck**

The Official Action contends that dielectric **18** of Tamura I functions as an electrostatic chuck because "dielectric material 18 holds substrate 1 by electrostatic adhesion" (emphasis added) (Official Action at page 2, lines 16-18). However, Tamura I discloses that to hold substrate **1** by electrostatic adhesion, an electrostatic force is generated by applying a high voltage to holding member **2** (column 14, lines 60-65). In other words, the Tamura I discloses that the combination of dielectric **18**, holding member **2** and "a high voltage power source" functions as an electrostatic

chuck, rather than the dielectric **18** in isolation. Contrary to the Examiner's position, dielectric 18 is not an electrostatic chuck.

If the Examiner considers the combination of dielectric **18**, holding member **2** and the high voltage power source of Tamura I equivalent to Appellant's "electrostatic chuck," then Appellant's "metallic heat transfer member" is missing from Tamura I, because the holding member **2** cannot correspond to an "electrostatic chuck" and an electrostatic chuck overlying a "metallic heat transfer member" as recited in Claim 1. If the Examiner considers holding member **2** of Tamura I equivalent to Appellant's "metallic heat transfer member," then the feature of an "electrostatic chuck" is missing from Tamura I. In view of the foregoing, because the combination of features recited in Claim 1 is not found in the cited references, the rejection should be reversed.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 1 under 35 U.S.C. §103(a). Dependent Claims 2, 4, 6, 7 and 12 are also patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

**C. <u>Dependent Claim 3</u>**

The Official Action acknowledges that Tamura I, Tamura II and Matsumura do not disclose the features of Claim 3 and cites Kadotani and Cardella to allegedly cure these deficiencies (Official Action at page 6, lines 17-18).

However, Kadotani discloses a 25 mm thick table 107 and even if the heat passage rate is doubled, the heating/cooling rate would be expected to be very slow

such as on the order of 1°C/minute (see paragraph **[0042]** of Appellant's specification).

Cardella relates to testing electronic devices at different temperatures (column 3, lines 2-14) using radiant or resistive heating (column 5, lines 9-16) and channels 135 are selected to remove heat generated by the electronic device rather than achieve a particular cooling rate.

Accordingly, Appellant respectfully submits that Kadotani and Cardella fail to provide any suggestion to modify the holding member 2 of Tamura to have the claimed dimensions much less the particular flow passage dimensions recited in Claim 3. Claim 3 is thus clearly patentable over the combination of applied references.

**D. <u>The Cited References Including Oda Do Not Disclose or Suggest All Claim Features - Dependent Claim 5</u>**

The Official Action contends that Claim 5 is allegedly unpatentable over Tamura I, Tamura II, Matsumura and Oda (Official Action at page 7, lines 17-19). Appellant respectfully disagrees, because the cited references including Oda do not disclose or suggest all claim features.

Claim 5 depends indirectly from Claim 1 and recites, *inter alia*, a substrate support wherein the source of temperature controlled liquid includes <u>a Peltier cooler operable to change the temperature of the liquid to a selected temperature</u> (emphasis added).

The Official Action contends that Oda "discloses a substrate support wherein the source of temperature controlled liquid includes a Peltier cooler operable to change <u>the temperature of the liquid to a selected temperature</u>" and cites cooling

device **106** in FIGs. 16 and 17 (emphasis added) (Official Action, page 7, lines 23-24).

However, Oda states that the substrate support is:

> characterized by the use of a low-temperature cooling gas on the occasion of such temperature regulation that the temperature of the hot plate P is lowered ... a cooling mechanism for obtaining such a low temperature gas will be explained based on FIG. 16 and FIG. 17 (column 12, lines 7-10).

In other words, cooling device **106**, which includes a Peltier element (column 12, lines 11-13), cools Oda's cooling gas, rather than cooling a "liquid to a selected temperature," as recited in Claim 5. Accordingly, the features recited in Claim 5 are missing in the cited references.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 5 under 35 U.S.C. §103(a).

**E. Dependent Claim 8**

The Official Action contends that Claim 8 is allegedly unpatentable over Tamura I, Tamura II, Matsumura, Yatsuda and Mahawili (Official Action at page 17, lines 13-16). Appellant respectfully disagrees, because: (1) the cited references do not disclose or suggest all claim features; (2) Yatsuda does not disclose or suggest a heat transfer member laterally spaced from a flange; and (3) Mahawili does not disclose or suggest a ceramic member and a metallic heat transfer member.

Claim 8 depends from Claim 1 and recites, *inter alia*, a substrate support wherein the ceramic member includes a recessed surface and a peripheral flange, the ceramic member has a thickness of from about 1-4 mm at the recessed surface;

the heat transfer member is disposed on the recessed surface and laterally spaced from the flange; and the electrostatic chuck contacts the flange (emphasis added).

### 1. The Cited Combination Including Yatsuda and Mahawili Does Not Disclose or Suggest All Claim Features

The Official Action has not addressed the claim feature "the ceramic member has a thickness of from about 1-4 mm at the recessed surface." Moreover, all five applied references do not disclose or suggest dimensions of the claimed recess surface.

### 2. Yatsuda Does Not Disclose or Suggest a Heat Transfer Member Laterally Spaced from the Flange

Yatsuda does not disclose or suggest the claim features of a "heat transfer member ... laterally spaced from the flange" as recited in Claim 8. The Official Action contends that the claimed "heat transfer member" corresponds to Yatsuda's aluminum worktable **18** (Official Action at page 8, lines 21-22). However, from Yatsuda's FIG. 1, worktable **18** is in direct lateral contact with insulating member **20**. In other words, worktable **18** is not "laterally spaced" from insulating member **20**.

The Official Action contends that this missing feature is suggested by Yatsuda "to allow for thermal expansion of the heat transfer member that is a metallic member" (Official Action at page 9, lines 1-3), but provides no citation to where the alleged suggestion in Yatsuda is found. To the contrary, Yatsuda is completely silent regarding the thermal expansion of worktable **18**.

Furthermore, Yatsuda discloses that a "cooling jacket **34** ... is formed in the worktable **18**, so that the wafer W is kept at a predetermined temperature" (emphasis added) (column 3, lines 53-55). Yatsuda's cooling jacket **34** further suggests that worktable **18** is maintained at a "predetermined temperature" thus, minimizing the

effects of thermal expansion. As such, Appellant respectfully submits that the rejection is improper as no teaching is identified in the prior art of a "heat transfer member ... laterally spaced from the flange," as recited in Claim 8.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 8 under 35 U.S.C. §103(a).

**3. Mahawili Does Not Disclose or Suggest a Ceramic Member and a Metallic Heat Transfer Member**

The Official Action contends that Mahawili's second member **18** corresponds to Appellant's "ceramic member" and Mahawili's first member **14** corresponds to Appellant's metallic "heat transfer member" (Official Action at page 9, lines 10-13). However, Mahawili discloses that platform **10** includes first member **14** and second member **18** (column 4, lines 23-24, lines 28-29), and the platform **10** is composed of a single material (column 5, lines 7-12). In other words, Mahawili discloses that first member **14** and second member **18** are composed of the same material, rather than a metallic first member **14** and a ceramic second member **18**. Accordingly, the rejection is in error and should be reversed.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 8 under 35 U.S.C. §103(a).

**F. Dependent Claims 9 and 10**

The Official Action acknowledges that Tamura I, Tamura II and Matsumura do not disclose the features of Claims 9 and 10 and cites Mimura to allegedly cure these deficiencies (Official Action at page 10, lines 3-13). However, Mimura fails to cure the above noted deficiencies regarding the combination of applied references,

with respect to Claim 1. Accordingly, Appellant respectfully submits that Claims 9 and 10 are patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

**G. Dependent Claim 11**

The Official Action acknowledges that Tamura I, Tamura II and Matsumura do not disclose the features of Claim 11 and cites Wang to allegedly cure these deficiencies (Official Action at page 11, lines 1-9). However, Wang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 11. Accordingly, Appellant respectfully submits that Claim 11 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

**H. Claims 15, 18 and 23**

The Official Action contends that Claims 15, 18 and 23 are allegedly unpatentable over Tamura I, Tamura II, Kadotani and Cardella (Official Action at page 11, lines 16-18). Appellant respectfully disagrees because: (1) a teaching of the claimed heating and/or cooling of 0.25 to 2°C/second rate via a heat transfer member having a liquid flow passage therein is missing in the cited references; (2) the cited references do not disclose or suggest all claim features; and (3) improper combination of Kadotani and Cardella.

Claim 15 recites a substrate support useful in a plasma processing apparatus, comprising: a source of temperature controlled liquid; a ceramic member; a metallic heat transfer member overlying the ceramic member, the heat transfer member including at least one flow passage in fluid communication with the liquid source and through which the liquid can be circulated <u>to heat and/or cool the heat transfer</u>

member at a rate of from about 0.25-2 °C/sec; and an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus (emphasis added).

### 1. The Claimed Substrate Support Providing Heating and/or Cooling of 0.25 to 2 °C/Second Provides an Unobvious Improvement Over Tamura

The claimed substrate support provides for a heat transfer member with a low thermal mass and dynamic temperature control capabilities for rapid heating and/or cooling to a desired temperature (page 5, lines 7-10; paragraph **[0019]**). Such a substrate support provides additional capabilities during the plasma processing of semiconductor substrates, for example, accurate, step-changeable temperature control in gate and shallow trench isolation etching processes (page 14, lines 10-15; paragraph **[0049]**). Further examples of increased capabilities include the ability to linearly ramp temperature to form tapered sidewalls or more effectively prevent thermal damage to the substrate during dielectric etch (page 14, lines 13-19; paragraph **[0049]**). The low thermal mass of the claimed substrate support also provides the advantage of consuming a smaller volumetric flow rate of liquid to achieve the desired temperature, as compared to a larger cold plate having a large thermal mass (page 12, lines 12-16; paragraph **[0043]**).

As described in the Appellant's specification, heating or cooling rates of 0.25 to 2 °C/second cannot be achieved with large metallic cold plates having a thickness of 1¼ inch or more (paragraph **[0042]**). As further explained in the specification, large metallic cold plates with a larger thermal mass provide only a limited temperature change rate of 1 °C/minute or less (paragraph **[0042]**).

Although Matsumura relates to heating substrates, Matsumura provides evidence that the claimed heating and cooling rates provide an unobvious improvement over Tamura wherein cooling is used only to withdraw heat from a substrate and maintain the substrate at a particular temperature. Matsumura discloses the difficulties in controlling heating rates (column 5, line 55 to column 6, lines 11; FIG. 4) by resistive heating for conventional heat process devices with 50 mm thick aluminum plate (column 4, lines 34-40). Although Matsumura is directed to rapid heating for baking photoresists, Matsumura recognizes the slowness in heating of large substrate supports using resistance wire heating. The claimed support provides an unobvious improvement over Tamura since the claimed support can provide rapid heating and rapid cooling whereas Tamura merely seeks to remove heat and maintain a substrate at a predetermined temperature.

### 2. <u>The Cited References Do Not Disclose or Suggest All Claim Features</u>

Appellant respectfully urges reversal of the rejection to Claims 15, 18 and 23, because the combination of Tamura I, Tamura II, Kadotani and Cardella does not disclose or suggest all claim features, as explained below.

#### a. <u>Kadotani Provides No Disclosure or Suggestion of the Claimed Heat Transfer Member Providing 0.25-2°C/second Heating/Cooling Rates - Claim 15</u>

Kadotani's specimen table **107** includes aluminum block **201**, in which specimen table **107** has <u>an entire thickness of 25 mm</u> (paragraph **[0058]**). As discussed above, and explained in the Appellant's specification, large metallic cold plates with a larger thermal mass of 1¼ inch (31.75 mm) provide only a limited temperature change rate of 1 °C/minute or less (paragraph **[0042]**). Thus,

Kadotani's specimen table **107** which includes aluminum block **201** is not suggestive of the subject matter recited in Claim 15.

Furthermore, while Kadotani discloses that the "heat passage rate [in the aluminum electrode block ] can be increased [from 200 $W/m^2K$ to 400 $W/m^2K$] by increasing the flow rate of the coolant" (paragraph **[0077]**), it is unknown what cooling rate Kadotani's arrangement can achieve because Kadotani is silent regarding cooling rate. Whether or not Kadotani could raise the heating or cooling rate from 1°C/minute to 2°C/minute by doubling the heat passage rate, Kadotani clearly does not disclose or suggest a heating/cooling <u>rate from about 0.25 to 2°C/seconds</u>, as recited in Claim 15. Thus, the Examiner's position that "[i]t would have been obvious to optimize flow passage dimensions as per heat transfer rate requirements" (Official Action at page 12, lines 2-4) lacks any factual basis and is based on speculation as to the cooling rate in Tamura. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968). The combined references fail to teach the claimed heating and cooling rate rendering the rejection untenable.

**b. <u>Cardella Provides No Disclosure or Suggestion of the Claimed Heating/Cooling Rates - Claim 15</u>**

Cardella discloses heating "electronic device **40** to a predetermined temperature at which device **40** is tested" (column 5, lines 10-12). Cardella discloses that "[t]he size, number, and arrangement of channels **135** [in heat transfer member **95**] are selected to transfer heat at a rate that is greater than the highest rate at which heat will be generated by the electronic device **40** undergoing testing." (column 6, lines 1-4). In other words, heat transfer member **95** maintains the

electronic device **40** at a predetermined, static temperature. Cardella clearly does not disclose or suggest a heating/cooling rate from about 0.25 to 2°C/seconds, as recited in Claim 15. The combined references fail to teach the claimed heating and cooling rate rendering the rejection untenable.

**c. Claim 15 - No Disclosure or Suggestion of an Electrostatic Chuck**

The Official Action contends that dielectric **18** of Tamura I functions as an electrostatic chuck because "dielectric material 18 holds substrate 1 by electrostatic adhesion" (emphasis added) (Official Action at page 2, lines 16-18). However, Tamura I discloses that to hold substrate **1** by electrostatic adhesion, an electrostatic force is generated by applying a high voltage to holding member **2** (column 14, lines 60-65). In other words, the Tamura I discloses that the combination of dielectric **18**, holding member **2** and "a high voltage power source" functions as an electrostatic chuck, rather than the dielectric **18** in isolation.

If the Examiner considers the combination of dielectric **18**, holding member **2** and the high voltage power source of Tamura I equivalent to Appellant's "electrostatic chuck," then Appellant's "metallic heat transfer member" is missing from Tamura I, because the holding member **2** cannot correspond to both the "electrostatic chuck" and "metallic heat transfer member" recited in Claim 15. Likewise, if the Examiner considers holding member **2** of Tamura I equivalent to Appellant's "metallic heat transfer member," then the feature of an "electrostatic chuck" is missing from Tamura I. Because Tamura already includes an electrostatic clamping arrangement, there would be no reason to modify Tamura I to include an additional electrostatic chuck overlying holding member 2.

**3. Improper Combination of Cardella**

Cardella relates to controlling the temperature of electronic devices such as during testing of integrated circuits (column 3, lines 3-10). Cardella uses heater **125** for radiant or resistive heating (column 5, lines 12-15). However, the Official Action has not provided "some articulated reasoning with some rational underpinning" as to why one of ordinary skill in the art would combine Tamura I, which is directed at cooling a substrate undergoing plasma treatment with gas in a vacuum environment with Cardella, which is directed at heating an electronic device to a static, predetermined temperature by resistive heating. *KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, slip op. at 14 (U.S. Apr. 30, 2007) (quoting *In re Kahn*, 441 F.3d 977, 988, (Fed. Cir. 2006)). Moreover, Appellant respectfully submits that the Examiner's statement that it would have been obvious to "control (optimize) the dimension of coolant liquid" to "obtain desired heat transfer rate" (Official Action at page 12, lines 16-19) is improper because an obviousness rejection cannot be supported by "mere conclusory statements." *Id.*

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 15 under 35 U.S.C. §103(a). Dependent Claims 18 and 23 are also patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

### I. Claim 16

The Official Action contends that Claim 16 is allegedly unpatentable over Tamura I, Tamura II, Kadotani, Cardella and Matsumura (Official Action at page 13, lines 1-4). Applicant respectfully disagrees because: (1) Matsumura does not recognize thickness of a liquid cooled heat transfer member as a result-effective

variable for quickly lowering the temperature of Tamura's support; (2) and the cited references do not disclose or suggest all of the claim features.

Claim 16 depends from Claim 15 and recites, *inter alia*, a substrate support wherein the heat transfer member has a maximum thickness of 1/8 inch (emphasis added).

### 1. Neither Tamura I Nor Matsumura Recognizes Thickness of a Liquid Cooled Heat Transfer Member as a Result-Effective Variable for Quickly Raising and Lowering Temperature

The Official Action acknowledges the Tamura I, Tamura II, Kadotani and Cardella do not disclose a thickness of a heat transfer member (Official Action at page 13, lines 5-6), but contends that it would have been obvious to "optimize the maximum thickness of [the] heat transfer member" as "an additional control variable for quickly raising and lowering the temperature of [the] heat transfer plate" (emphasis added) (Official Action at page 13, lines 15-19). Appellant respectfully disagrees, because Tamura does not seek to quickly raise or lower temperature and Matsumura's resistance heating for baking photoresist uses a different mechanism for a different function than the holding table of Tamura.

Matsumura is directed at a heating device "to apply uniform heat ... to an object to be processed" (emphasis added) (column 2, lines 19-20) in the context of curing a photoresist film on a semiconductor substrate (column 1, lines 23-26). Matsumura's heat transfer plate **1** is thinner than a plate with resistance heating wires because the application of current to a thin conductive film **2** produces a more uniform temperature (column 4, lines 41-55; FIG. 7), than heating elements that use an electric resistance wire (column 1, lines 29-37). Thus, Matsumura provides no recognition of optimizing the thickness of a liquid cooled heat transfer plate **1** and

neither Tamura nor Matsumura teach the desirability of "quickly lowering the temperature," as proposed in the Official Action. Matsumura does not relate to a liquid cooled heat transfer plate as in Tamura I and Matsumura's resistive heating arrangement for baking photoresists fails to support the Examiner's "optimization" position.

### 2. No Disclosure or Suggestion of a Heat Transfer Member Having a Maximum Thickness of ⅛ Inch and Including at Least One Flow Passage

Neither Tamura I, Tamura II, Kadotani, Cardella nor Matsumura discloses a liquid cooled plate ⅛ inch or smaller. The teaching of such a thin heat transfer member is totally missing in the cited references. Matsumura discloses a heating element used for baking photoresist films on semiconductor wafers (column 1, line 9 to column 2, line 26). Heat is conducted to semiconductor wafer **8** by contact with heating plate **1** (column 4, lines 1-5). The heat transfer plate of Matsumura operates by electric heating (column 1, lines 55-57). In Matsumura, there is no liquid cooling mechanism, much less a heat transfer member having a maximum thickness of ⅛ inch and including at least one flow passage, as recited in Claim 16.

Tamura I discloses a substrate holding system including coolant flow passages **42** in holding member **2** (column 15, lines 40-47). Tamura II is cited to demonstrate that liquid coolant is "an art recognized coolant material" (Official Action at page 5, lines 3-6). Tamura II is cited to demonstrate that liquid coolant is "an art recognized coolant material" (Official Action at page 5, lines 3-6). However, neither Tamura I nor Tamura II provide any disclosure of a heat transfer member having a

maximum thickness of ⅛ inch and including at least one flow passage, as recited in Claim 16.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 16 under 35 U.S.C. §103(a).

**J. Dependent Claim 17**

The Official Action contends that Claim 17 is allegedly unpatentable over Tamura I, Tamura II, Kadotani, Cardella and Yang (Official Action at page 13, lines 21-23).

The Official Action acknowledges that Tamura I, Tamura II, Kadotani and Cardella do not disclose the features of Claim 17 and cites Yang to allegedly cure these deficiencies (Official Action at page 13, line 21 to page 14, line 13). However, Yang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15. Accordingly, Appellant respectfully submits that Claim 17 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

**K. Dependent Claim 19**

The Official Action contends that Claim 19 is allegedly unpatentable over Tamura I, Tamura II, Kadotani, Cardella, Yatsuda and Mahawili (Official Action at page 14, lines 15-18). Appellant respectfully disagrees, because: (1) Yatsuda does not disclose or suggest a heat transfer member laterally spaced from a flange; and (2) Mahawili does not disclose or suggest a ceramic member and a metallic heat transfer member.

Claim 19 depends from Claim 15 and recites, *inter alia*, a substrate support wherein the ceramic member includes a recessed surface and a peripheral flange, <u>the heat transfer member is disposed on the recessed surface and laterally spaced from the flange</u>; and the electrostatic chuck contacts the flange (emphasis added).

### 1. <u>Yatsuda Does Not Disclose or Suggest a Heat Transfer Member Laterally Spaced from the Flange</u>

Yatsuda does not disclose or suggest the claim features of a "heat transfer member ... laterally spaced from the flange" as recited in Claim 19. The Official Action contends that "heat transfer member" corresponds to Yatsuda's aluminum worktable **18** (Official Action at page 14, lines 22-23). However, from Yatsuda's FIG. 1, worktable **18** is in <u>direct lateral contact</u> with insulating member **20**. In other words, worktable **18** is not "laterally spaced" from insulating member **20**.

The Official Action contends that this missing feature is obvious "to allow for thermal expansion of the heat transfer member that is a metallic member" (Official Action at page 15, lines 4-5), but provides <u>no citation</u> to where the alleged motivation or suggestion in Yatsuda is found. Moreover, while Yatsuda is <u>completely silent</u> regarding the thermal expansion of worktable **18**, the fact remains that there is no space between worktable **18** and insulating member **20** of Yatsuda.

Furthermore, Yatsuda discloses that a "cooling jacket **34** ... is formed in the worktable **18**, so that the <u>wafer W is kept at a predetermined temperature</u>" (emphasis added) (column 3, lines 53-55). Yatsuda's cooling jacket **34** further suggests that worktable **18** is maintained at a "predetermined temperature" thus, minimizing the effects of thermal expansion. As such, Appellant respectfully submits that the

claimed "heat transfer member ... laterally spaced from the flange" as recited in Claim 19 is missing in the cited references.

### 2. Mahawili Does Not Disclose or Suggest a Ceramic Member and a Metallic Heat Transfer Member

The Official Action contends that Mahawili's second member **18** corresponds to Appellant's "ceramic member" and Mahawili's first member **14** corresponds to Appellant's metallic "heat transfer member" (Official Action at page 15, lines 12-15). Mahawili discloses that platform **10** includes first member **14** and second member **18** (column 4, lines 23-24, lines 28-29), and that platform **10** is composed of a single material (column 5, lines 7-12). In other words, Mahawili discloses that first member **14** and second member **18** are composed of the same material, rather then a metallic first member **14** and a ceramic second member **18**. As such, Appellant respectfully submits that the claimed "heat transfer member ... laterally spaced from the flange" as recited in Claim 19 is missing in the cited references.

Because a *prima facie* case of obviousness has not been established, Appellant respectfully requests reversal of the rejection of Claim 19 under 35 U.S.C. §103(a).

### L. Dependent Claims 20 and 21

The Official Action acknowledges that Tamura I, Tamura II Kadotani and Cardella do not disclose the features of Claims 20 and 21 and cites Mimura to allegedly cure these deficiencies (Official Action at page 16, lines 3-13). However, Mimura fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15. Accordingly, Appellant respectfully submits that Claims 20 and 21 are patentable over the combination of applied

references for at least the same reasons as those discussed above regarding Claim 15.

**M. Dependent Claim 22**

The Official Action acknowledges that Tamura I, Tamura II, Kadotani and Cardella do not disclose the features of Claim 22 and cites Wang to allegedly cure these deficiencies (Official Action at page 17, lines 1-9). However, Wang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15. Accordingly, Appellant respectfully submits that Claim 22 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

## VIII. Claims Appendix

See attached Claims Appendix for a copy of the claims involved in this appeal.

## IX. Evidence Appendix

Appellant does not rely on any evidence for this appeal .

## X. Related Proceedings Appendix

There are no Related Proceedings for this appeal as indicated on the attached Related Proceedings Appendix.

## XI. Conclusion

For the reasons set forth above, it is respectfully submitted that the pending claims are allowable. Reversal of the rejections is respectfully requested.

Respectfully submitted,

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## VIII. CLAIMS APPENDIX

**The Appealed Claims**

1. (Original) A substrate support useful in a reaction chamber of a plasma processing apparatus, the substrate support comprising:

a ceramic member;

a metallic heat transfer member overlying the ceramic member, the heat transfer member having a maximum thickness of about ¼ inch, the heat transfer member including at least one flow passage through which a liquid can be circulated to heat and/or cool the heat transfer member; and

an electrostatic chuck overlying the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus.

2. (Original) The substrate support of claim 1, wherein the heat transfer member has a maximum thickness of about 1/8 inch.

3. (Original) The substrate support of claim 1, wherein the at least one flow passage has a width of about 1/32 to about 3/32 inch, and a depth of about 1/32 to about 1/16 inch.

4. (Original) The substrate support of claim 1, further comprising a source of temperature controlled liquid in flow communication with the at least one flow passage.

5. (Original) The substrate support of claim 4, wherein the source of temperature controlled liquid includes a Peltier cooler operable to change the temperature of the liquid to a selected temperature.

6. (Original) The substrate support of claim 4, further comprising:

a heat transfer gas source operable to supply a heat transfer gas between the support surface and the substrate; and

a controller operable to (i) control the volumetric flow rate and/or the temperature of the liquid circulated through the at least one flow passage, and/or (ii) to control the flow rate and/or pressure of the heat transfer gas supplied between the support surface and the substrate.

7. (Original) The substrate support of claim 1, wherein the heat transfer member comprises a base including the at least one flow passage, and a cover overlying the base.

8. (Original) The substrate support of claim 1, wherein: the ceramic member includes a recessed surface and a peripheral flange, the ceramic member

has a thickness of from about 1-4 mm at the recessed surface; the heat transfer member is disposed on the recessed surface and laterally spaced from the flange; and the electrostatic chuck contacts the flange.

9. (Original) The substrate support of claim 1, further comprising a ceramic ring overlying the ceramic member and surrounding the heat transfer member and the electrostatic chuck, the heat transfer member being laterally spaced from the ceramic ring, the electrostatic chuck contacting the ceramic ring.

10. (Original) The substrate support of claim 1, further comprising an RF power source electrically connected to the heat transfer member.

11. (Original) The substrate support of claim 1, further comprising an elastomeric joint between the ceramic member and the heat transfer member, and an elastomeric joint between the heat transfer member and the electrostatic chuck.

12. (Original) A plasma processing apparatus comprising the substrate support of claim 1.

13. (Withdrawn) A method of thermally controlling a substrate in a plasma processing apparatus, comprising: placing a substrate on the support surface of the substrate support according to claim 1 in a reaction chamber of a plasma processing

apparatus; introducing a process gas into the reaction chamber; generating a plasma from the process gas in the reaction chamber; processing the substrate; and circulating a liquid through the at least one flow passage to control the temperature of the heat transfer member to a selected temperature during processing of the substrate.

14. (Withdrawn) The method of claim 13, further comprising: circulating a liquid having a first temperature through the at least one flow passage to control the temperature of the heat transfer member to a first temperature during processing of the substrate; and circulating a liquid having a second temperature through the at least one flow passage to control the temperature of the heat transfer member to a second temperature during processing of the substrate; wherein the temperature of the heat transfer member is (i) ramped from the first temperature to the second temperature, or (ii) changed step-wise from the first temperature to the second temperature.

15. (Original) A substrate support useful in a plasma processing apparatus, comprising: a source of temperature controlled liquid; a ceramic member; a metallic heat transfer member overlying the ceramic member, the heat transfer member including at least one flow passage in fluid communication with the liquid source and through which the liquid can be circulated to heat and/or cool the heat transfer member at a rate of from about 0.25-2 °C/sec; and an electrostatic chuck overlying

the heat transfer member, the electrostatic chuck having a support surface for supporting a substrate in a reaction chamber of a plasma processing apparatus.

16. (Original) The substrate support of claim 15, wherein the heat transfer member has a maximum thickness of 1/8 inch.

17. (Original) The substrate support of claim 15, further comprising: a heat transfer gas source operable to supply a heat transfer gas between the support surface and the substrate; and a controller operable to control operation of the liquid source and the heat transfer gas source.

18. (Original) The substrate support of claim 15, wherein the heat transfer member comprises a base including at least one flow passage, and a cover overlying the base.

19. (Original) The substrate support of claim 15, wherein the ceramic member includes a recessed surface and a peripheral flange, the heat transfer member is disposed on the recessed surface and laterally spaced from the flange, and the electrostatic chuck contacts the flange.

20. (Original) The substrate support of claim 15, further comprising a ceramic ring overlying the ceramic member and surrounding the heat transfer

member and the electrostatic chuck, the heat transfer member being laterally spaced from the ceramic ring, the electrostatic chuck contacting the ceramic ring.

21. (Original) The substrate support of claim 15, further comprising an RF power source electrically connected to the heat transfer member.

22. (Original) The substrate support of claim 15, further comprising an elastomeric joint between the ceramic member and the heat transfer member, and an elastomeric joint between the heat transfer member and the electrostatic chuck.

23. (Original) A plasma processing apparatus comprising the substrate support of claim 15.

24. (Withdrawn) A method of thermally controlling a substrate in a plasma processing apparatus, comprising: placing a substrate on the support surface of the substrate support according to claim 15 in a reaction chamber of a plasma processing apparatus; introducing a process gas into the reaction chamber; generating a plasma from the process gas in the reaction chamber; processing the substrate; and circulating the liquid from the liquid source through the at least one flow passage to control the temperature of the heat transfer member to a selected temperature during processing of the substrate.

25. (Withdrawn) The method of claim 24, further comprising: circulating a liquid having a first temperature through the at least one flow passage to control the temperature of the heat transfer member to a first temperature during processing of the substrate; and circulating a liquid having a second temperature through the at least one flow passage to control the temperature of the heat transfer member to a second temperature during processing of the substrate; wherein the temperature of the heat transfer member is (i) ramped from the first temperature to the second temperature, or (ii) changed step-wise from the first temperature to the second temperature.

26. (Withdrawn) A method of processing a substrate in a plasma processing apparatus, comprising: supporting a substrate on a support surface of an electrostatic chuck in a reaction chamber of a plasma processing apparatus; plasma processing the substrate; and circulating a liquid through at least one flow passage extending through a metallic heat transfer member underlying the electrostatic chuck so as to control the temperature of the substrate, the heat transfer member having a maximum thickness of about ¼ inch.

27. (Withdrawn) The method of claim 26, wherein the heat transfer member has a maximum thickness of about 1/8 inch, and the at least one flow passage has a width of about 1/32 to 3/32 inch, and a depth of about 1/32 to 1/16 inch.

28. (Withdrawn) The method of claim 26, further comprising supplying a heat transfer gas between the support surface and the substrate during plasma processing of the substrate.

29. (Withdrawn) The method of claim 26, further comprising applying RF power to the heat transfer member.

30. (Withdrawn) The method of claim 26, wherein the heat transfer member is heated and/or cooled by the liquid at a rate of from about 0.25-2 °C./sec.

31. (Withdrawn) The method of claim 26, further comprising: circulating a liquid having a first temperature through the at least one flow passage to control the temperature of the heat transfer member to a first temperature during processing of the substrate; and circulating a liquid having a second temperature through the at least one flow passage to control the temperature of the heat transfer member to a second temperature during processing of the substrate; wherein the temperature of the heat transfer member is (i) ramped from the first temperature to the second temperature, or (ii) changed step-wise from the first temperature to the second temperature.

## IX. EVIDENCE APPENDIX

Appellant does not rely on any evidence for this appeal.

## X. RELATED PROCEEDINGS APPENDIX

There are no related proceedings for this appeal.